



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/512,091	10/21/2004	Toshiyuki Fujimoto	0234-0478PUS1	8585

2292 7590 04/04/2008
BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

EXAMINER

CHANDRA, SATISH

ART UNIT	PAPER NUMBER
----------	--------------

1792

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

04/04/2008

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No. 10/512,091	Applicant(s) FUJIMOTO ET AL.	
	Examiner SATISH CHANDRA	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11 - 27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11 - 27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/04, 1/05, 1/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/23/2008 has been entered.

Claim Objections

Claim 19 is objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim *should refer to other claims in the alternative only and/or cannot depend from any other multiple dependent claims* 13 to 18. See MPEP § 608.01(n). Accordingly, the claim 19 has not been further treated on the merits.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claim 20 is rejected under 35 U.S.C. 102(e) as being anticipated by
Watanabe et al (US 2002/0132063).**

Watanabe et al discloses an electron gun 8 (Para 0029, Fig 2) to irradiate an electron beam toward a respective crucible 7 into which a film material 9 is supplied and is heated by the irradiation of the electron beam by the electron gun 8.

The film forming apparatus 20 (Fig 1) in which film materials evaporated by the respective main heating processes are further ionized by an electric field formed within the vacuum chamber 1 (Para 0055).

It is inherent to have plasma and electric field where electron guns are used.

The use of the metal cluster complex for generating ion beam is the intended use of the apparatus. The apparatus of Watanabe et al is capable of generating ion beams by using metal cluster complex.

Claims 20, 21, 26 and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Cadieu (US 6,805,916).

Cadieu discloses a magnetic field pulsed laser deposition (PLD) system (Fig 1) wherein when the laser 20 is activated, pulsed energy is directed to a region of the target 30 to form the plume 31 of vaporized target material containing ions (Column 1, lines 58-60).

The use of the metal cluster complex for generating ion beam is the intended use of the apparatus. The apparatus of Cadieu is capable of generating ion beams by using metal cluster complex of uniform cluster size.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 11 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morimoto et al (US 4,559,901) in view of Dykstra (US 2002/0162508).

Morimoto et al discloses an apparatus (Fig 9, Column 8, lines 1 –15) wherein the heating of the crucible 15 is carried out using electrons emitted from a filament 17. The vaporized multi nuclear metal material ejected from the nozzle 14 is ionized from an ionization electron emitting filament 19. To accelerate the ionized cluster of uniform cluster size, an electric field produced by the accelerating electrode 23 (acceleration means) enters or penetrates into the ionization region 22 to form a convergent lens system (Column 3, lines 7 – 13).

Morimoto et al does not disclose scanning means.

Dykstra discloses a scanning mechanism 116 (Fig 1) for scanning the accelerated ion clusters to uniformly process the surface of the target 118 or work-piece (Para 0007).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide scanning means for scanning the ion clusters in the apparatus of Morimoto et al as taught by Dykstra. It would have obvious to a skilled artisan to combine prior art elements to yield predictable results such as providing

scanning means for scanning the ion clusters in the apparatus of Morimoto et al as taught by Dykstra.

The motivation of providing scanning means is scan the ion clusters to uniformly process the target surface as taught by Dykstra. Further, it has been held Inclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims. In re Young, 75 F.2d 966, 25 USPQ 69 (CCPA 1935) (as restated in In re Otto, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963)).

Claims 12 – 14 and 16 – 18, 24, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamashita et al (US 2002/0029746) in view of Horsky (US 7,107,929).

Yamashita et al discloses:

Regarding claims 12 – 14, 16 – 18 and 22, a vaporizing mechanism 4(Fig 1), a metal cluster complex 6, 6a in the vaporizing mechanism as a vaporization material source; an ionization chamber 16 (plasma 24 producing vessel) ; the vaporizing mechanism vaporizes the metal cluster complex and discharges the vaporized metal cluster complex of uniform cluster size into the first conduit 10, the ionization chamber 16 (the second pipe) receives the vaporized metal cluster complex, and the received vaporized metal cluster complex is ionized in the ionization chamber 16 (plasma 24 producing vessel). A filament 16 (electric field) for thermionic emission (means for ionizing) is provided on one side of the ionization vessel 16 (Fig 1). An atomizing mechanism

Yamashita et al does not disclose:

Art Unit: 1792

A first conduit wherein the vaporizer mechanism is housed in.

Horsky discloses: an ion implantation ion source, system and method wherein a thermally insulating sleeve (pipe) 31 surrounds (houses) the vaporizer 19 (Column 24, lines 7 – 10).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a pipe (insulated sleeve) housing the vaporizer in the apparatus of Yamashita et al as taught by Horsky. It would have obvious to a skilled artisan to combine prior art elements to yield predictable results such as housing the vaporizer in the apparatus of Yamashita et al in a pipe as taught by Horsky.

The motivation for providing a pipe (insulated sleeve) housing the vaporizer in the apparatus of Yamashita et al as taught by Horsky is to minimize the vaporizer's heat losses in the apparatus of Yamashita et al.

Yamashita et al and Horsky do not disclose:

a second conduit crossing the first conduit.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an apparatus wherein the second pipe (ionization chamber) crosses the first pipe housing the vaporizer in the apparatus of Yamashita et al and Horsky.

The motivation for providing an apparatus wherein the second pipe (ionization chamber) crosses the first pipe housing the vaporizer in the apparatus of Yamashita et al and Horsky is to optimize the apparatus of Yamashita et al and Horsky for the ion beam irradiation. Further it has been held mere rearrangement of parts which does not

modify the operation of a device is prima facie obvious. In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975).

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamashita (US 2002/0029746) and Horsky (US 7,107,929) as discussed in claims 12 – 14 and 16, 18 above and further in view of Mizutani et al (US 5,284,544).

Yamashita and Horsky were discussed above.

Yamashita and Horsky do not disclose the use of light irradiation for ionizing molecules that are vaporized or atomized.

Mizutani et al discloses (Column 5, lines 40 – 50) to form radicals (ions) by excitation or dissociation by photo-absorption of gas molecules.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form radicals (ions) by excitation or dissociation by photo-absorption of gas molecules in the apparatus of Yamashita and Horsky as taught by Mizutani et al. It would have obvious to a skilled artisan to combine prior art elements to yield prior art elements such as forming radicals (ions) by excitation or dissociation by photo-absorption of gas molecules in the apparatus of Yamashita and Horsky as taught by Mizutani et al.

The motivation to form ions by excitation or dissociation by photo-absorption of gas molecules is to provide an alternate and equivalent means of ionizing gas or vapor or supply less energetic ions to prevent damage to the substrate in the apparatus of Yamashita et al and Mizutani et al as taught by Mizutani et al. Further, it has been held

Inclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims. In re Young, 75 F.2d 966, 25 USPQ 69 (CCPA 1935) (as restated in In re Otto, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963)).

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamashita (US 2002/0029746), Horsky (US 7,107,929) and Morimoto et al (US 4,559,901).

Yamashita and Horsky were discussed above. Yamashita discloses discharging vaporized material 6 (Fig 1) into the ionization chamber 16 (second conduit) via a conduit 10.

Yamashita and Horsky do not disclose: an atomized mechanism atomizing the metal cluster complex and discharge a mist of metal cluster complex into the second conduit.

Morimoto et al discloses: an apparatus (Fig 9, Column 8, lines 1 –15) wherein the heating of the crucible 15 is carried out using electrons emitted from a filament 17. The vaporized multi nuclear metal material ejected from the nozzle 14 (atomizer, atomized mechanism) is ionized from an ionization electron emitting filament 19.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a nozzle (atomized mechanism) in the vaporizer to atomize the vaporized material in the apparatus of Yamashita, Horsky as taught by Morimoto et al. It would have obvious to a skilled artisan to combine prior art elements to yield predictable results such as providing a nozzle (atomized mechanism) in the

Art Unit: 1792

vaporizer to atomize the vaporized material in the apparatus of Yamashita, Horsky as taught by Morimoto et al.

Response to Arguments

Applicant's arguments with respect to claim 1/23/2008 have been considered but are moot in view of the new ground(s) of rejection. The applicant's main argument is over the intended use of the apparatus and using a metal cluster complex, chemically stable compound, for generating an ion beam. None of the references used in rejecting claims, uses metal cluster complex.

Regarding the arguments:

II. Claim 11 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Morimoto et al. (USPN 4,559,901) in view of Dykstra (US 2002/162508).

In the Response to Arguments section on page 7 of the Office Action, the Examiner advises that the arguments filed May 11, 2007 are not persuasive, as claims 1 and 3-11 are apparatus claims and not method claims. The use of the metal cluster complex for generating the ion beam is the intended use of the apparatus.

To expedite prosecution, independent claim 11 has been amended to recite:

A cluster beam apparatus, comprising: vaporization means for vaporizing or atomizing a metal cluster complex;

ionization means for ionizing the vaporized or atomized metal cluster complex;

acceleration means for accelerating the ionized metal cluster complex;

convergence means for converging an orbit of a beam of the metal cluster complex accelerated by the acceleration means; and

scanning means for scanning with the beam of the metal cluster complex accelerated and converged, toward a substrate, by making the orbit of the beam to be curved.

Each of the recitations of claim 11 are means plus function recitations. The sixth paragraph of 35 U.S.C. § 112 permits an element in a claim for a combination to be expressed as a means or step for performing a specified function without recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof. See *In re Donaldson*, 16 F.3d 1189, 29 USPQ2d 1845 (Fed. Cir. 1994).

Thus, the recited vaporization means has the specific function "for vaporizing or atomizing a metal cluster complex", which must be considered in determining patentability of amended claim 11. As noted in the previous response, one of the features of the inventions

recited in amended claim 11 resides in that a metal cluster complex, which is a chemically stable compound, is utilized for a cluster beam source. That is, the above feature of the inventions recited in amended claim 11 is that the beam source is already a cluster, but not a cluster that is formed in a gas phase.

A cluster ion beam is useful. However, although it is necessary to control the cluster ion beam to have a given cluster size, such controlling has been difficult with the conventional techniques. With the invention recited in amended claim 11, contrary to the conventional techniques, it is possible to obtain a

Art Unit: 1792

cluster beam formed by the metal cluster complex molecules uniform in the cluster complex size by using, as a raw material of the beam, a chemically stable metal cluster complex, which already has cluster structure in its solid state and can provide a sample (gas) uniform in cluster complex size of the resulting cluster complexes.

Generally, a cluster beam is intended to utilize a function as a plurality of clusters of atoms. This function is predominantly governed by cluster complex size in a molecular beam to be emitted. Thus, if the cluster complex has a distribution of cluster complex size, it hinders utilization of the cluster beam. Further, distribution of cluster complex size is based on the difference of the mass number of clusters contained therein. However, it is difficult to converge a beam that has such distribution of cluster complex size. This hinders the utilization of the cluster beam.

As explained above, when a metal cluster complex is utilized as a source for generating a molecular beam, i.e. a cluster ion beam (see page 21 in lines 10 to 11 of the present application), the metal cluster complex is released from the solid into a gas phase, while the unit structure of such a complex molecule is maintained. This is because the metal cluster complex molecule is

chemically stable. As a result of this phenomenon, the resulting cluster complex size in the gas phase has no distribution.

Applicants submit that none of the applied prior art references cited by the Examiner discloses or suggest the above-mentioned utilization of a metal cluster complex as a cluster beam source. In this regard, it should be noted that Morimoto et al. (USPN 4,559,901) uses MgF₂, ZnO, Si, Au, Ag, GaAs, BeO, GaP (col. 9, lines 48-53); and Dykstra (US 2002/162508) uses source 114 gases of Ar, inert gases, O₂, N₂, oxygen-bearing gases (e.g. CO₂), nitrogen-bearing gases, halogens, halogen-bearing gases (Fig. 1, paragraphs [00051, [0007]). Therefore, Morimoto et al. and Dykstra do not disclose or suggest:

vaporization means for vaporizing or atomizing a metal cluster complex;

ionization means for ionizing the vaporized or atomized metal cluster complex;

acceleration means for accelerating the ionized metal cluster complex;

convergence means for converging an orbit of a beam of the metal cluster complex accelerated by the acceleration means; and scanning means for scanning with the beam of the metal cluster complex accelerated and converged, toward a substrate, by making the orbit of the beam to be curved.

In view of the above, the allowance of amended claim 11 is respectfully solicited.

The Examiner disagrees because of the following reasons:

The Examiner believes that the use of the metal cluster complexes for generating the ion beam is the intended use of the apparatus. A different reference of Higuchi (not used in claims' rejection) also discloses (US 5,079,224) in Fig 1, spouting **evaporated metallic element** from the crucible as a **cluster beam**, the spouted evaporation metallic element is ionized and accelerated through an electric field, impinging on the substrate. In the Fig 1, the reference numerals 1, 2 and 3 denote **metallic materials**, and in the present embodiment each of the metallic elements Ba, Y and Cu may be respectively used in a state of powder, flake or pellet. Each of the metallic elements 1, 2

Art Unit: 1792

and 3 is charged in separate closed type crucibles 11, 12 and 13 respectively as a substantially pure substance. In the closed type crucibles 11, 12 and 13, there are respectively provided one or plural discharge openings 21, 22 and 23 having a diameter of 0.5 to 2.0 mm for spouting said metallic elements respectively, each of the discharge tubes comprising shutters 61, 62, 63 for controlling the amount of the metallic evaporation stream to be spouted. Moreover, said crucibles 11, 12 and 13 respectively comprise heating devices 31, 32 and 33 for heating and spouting each of the metallic elements 1, 2 and 3. A resistance heating method or an electron impact method may be adopted as a heating method of said heating devices 31, 32 and 33.

Therefore, it would have been obvious to a skilled artisan to use either metallic elements or chemically stable metal cluster complexes in generating ion beam in the all the references used above in rejecting all the claims. Therefore, using a material (either metallic or metal cluster complex) for generating an ion beam is the intended use of the apparatus. Further it has been held claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). If a prior art structure is capable of performing the intended use as recited in the preamble, then the preamble does not define over it. In re Schreiber, 128 F.3d 1473, 1477, 44 USPQ2d 1429, 1431 (Fed. Cir. 1997). A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SATISH CHANDRA whose telephone number is (571)272-3769. The examiner can normally be reached on 8 a.m. - 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, Primary Examiner, Jeffrie R. Lund can be reached on 571-272-1437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jeffrie R. Lund/
Primary Examiner, Art Unit 1792

Satish Chandra

Jeffrie R. Lund
Primary Examiner

SC
3/4/208